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AGRICULTURAL ECONOMICS RESEARCH

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A Planning-Decision Model for Surplus Commodity Removal Programs

By R. C. Haidacher, Richard Haynes, David Culver, and Jim L. Matthews

The prototype model developed in this paper is a deterministic simulation system, used to develop alternative commodity purchase plans and to show their differential impacts in terms of costs, tradeoffs, and benefits. The model incorporates systems of demand parameters to account for economic interdependence among commodities, alternative decision criteria to reflect different emphasis on program objectives, and various constraints to account for program operating restrictions and requirements. The operation of the model is illustrated by a hypothetical example based on Section 32 purchases for the School Lunch Program. The empirical results are reasonably realistic and provide ample evidence to demonstrate the model's usefulness and versatility.

Keywords: Decision model, Food, Model, Policies, Programs, Purchases, Simulation.

One aspect of the administrative decision process inherent in certain authorized Government programs is the planning phase. This paper describes a prototype model that can be used as an aid in that aspect of the decision process for a particular program, namely, surplus commodity removal under Section 32 of the Agricultural Adjustment Act of 1935, as amended.

It is useful to characterize the administrative decision process as generally consisting of three major parts. The first part is usually termed the planning phase of the decision process. It consists of selecting a given plan or course of action from the set of feasible alternatives. A feasible alternative plan is one which meets the imposed restrictions of the problem and satisfies the objectives to a greater or lesser extent. A major aspect of this part of the process is usually directly concerned with, or related to, budget allocation. The second part of the process concerns implementation of the selected plan, while the third part deals with assessment and evaluation of the actual impacts of the selected course of action. This suggested ordering appears to be a logical sequence, and while the parts are not independent, it seems reasonable to separate them for purposes of analysis and modeling. The present exposition focuses only on the first part, dealing with the plan-selection phase of the planning-decision process.

In any given program the authorizing legislation usually specifies or implies one or more *goals* or *objectives* that are to be attained by the program. These goals or objectives may be independent or interdependent and they may be complementary or competitive. To achieve the specified goals, provision is made for certain *instruments*, which are the variables subject to control by the administrative agency. Control of these variables is most often achieved through funds provided by a *budget*. More often than not, the task is complicated further by the imposition of certain limitations on how the objectives can be attained or conditions that must be satisfied in fulfilling the objectives. These conditions are called *restrictions* or *constraints*. The final element of the plan-selection process concerns the possible *impacts* of a given plan. These consist of both quantitative and qualitative effects. The former include most economic effects while the latter include political effects.

The Specific Problem—Section 32

Section 32 of the Agricultural Adjustment Act of 1935, as amended, provides authorization and funds for the Department of Agriculture to encourage export and domestic consumption of agricultural products for the purpose of contributing to market price stabilization, through actual market entry or announcements that the Department stands ready to enter the market (*5*, pp. 17,18).

Funds are appropriated annually by the Congress. The amount available for use under Section 32 is equal to 30 percent of customs receipts collected during the preceding calendar year, plus unused balances of up to $300 million. Funds actually obligated and expended on commodities depend on the market situation, volume of surpluses, and availability of potential outlets.

The original legislation and subsequent amendments give authorization and responsibility to the Secretary and the Department of Agriculture for the various programs and activities. Responsibility for carrying out the programs and coordinating the various activities has been delegated to USDA's Agricultural Marketing Service (AMS) and its Administrator.

It seems reasonable to presume that the intent of the original legislation was primarily to provide some means of support for those commodity subsectors that were economically depressed and without adequate alternative means of support. And it seems reasonable to infer that inherent in the legislation was the presumption that the specified market-oriented activities would enhance the prices and incomes of commodity producers. Thus, we may say that one of the major implied objectives of the program was to enhance producer prices and income for those commodity sectors determined to be economically depressed.

Since the inception of Section 32, certain specifications and restrictions have evolved. For example, the principal use of funds has been restricted to perishable, nonbasic commodities which do not have in operation a price support program. The major restriction on expenditures is that no more than 25 percent of total available funds may be used for any one commodity.

Also, as Section 32 programs have evolved over time, they have been operated in conjunction with various food distribution programs so that surpluses removed from the market are donated to schools, institutions, and needy persons. Responsibility for the various food distribution programs is delegated to the Food and Nutrition Service (FNS) of the Department. Section 32 funds are being used (1) in partial support for child nutrition programs authorized by the School Lunch Act and the Child Nutrition Act, (2) for financial assistance to enable certain low income counties to operate food distribution programs, and (3) for a food certificate program and special supplementary food packages for expectant mothers, new mothers, and infants (5, p. 18).

In terms of the original legislation and its implied objectives, the food distribution activities may be viewed as providing a means for "encouraging domestic consumption of agricultural products." In this light the numerous conditions which must be satisfied can be viewed as restrictions or constraints which have to be met in conjunction with surplus removal through commodity purchases. For example, these constraints include specifications on minimum quantities necessary for national distribution, product form, container size, and nutritional level.

Given the implied objectives, the number of varied activities with their implied constraints, and the number of potential commodities that may be eligible, it becomes evident that operation and coordination of such a program constitute a complex decision process. That is, given these conditions, a decision must be made regarding (1) those commodities eligible for support out of the potential set of commodities, (2) the amount to be spent on each commodity, and (3) the timing of purchases with respect to season, the location of purchase with respect to region, and so on. Add to this the economic interdependence between commodities, so that purchase of any given commodity may affect the prices of many other commodities, and the necessity for a systematic framework to facilitate this decision process is readily apparent.

Development of a Prototype Model

Two important sets of factors must be considered in developing a model to aid in the decision process described above. For expository convenience we might call the first economic considerations and the second administrative considerations.

The two most important economic factors are economic interdependence and the nature of the market mechanism. Theoretically, economic interdependence exists to a greater or lesser extent among the prices of all goods in an economy. Thus, relationships may exist among prices of specific commodities under Section 32, between Section 32 commodities and other commodities, and between various levels in the market from farm to retail. At any given level the interrelations among various commodity prices can be taken into account by a complete set or matrix of demand parameters which show the quantitative relation between commodity prices and quantities. Conceptually, a set of these parameters exists at each level in the system and a relationship between each level and the next is implied. For Section 32 activities this is important because purchases are generally made at several stages removed from the farm level, whereas a major objective relates to benefits accruing at or near the farm level.

Assumptions regarding the nature of the market mechanism are important in designing a prototype model from both the economic and the administrative viewpoint. The administrative issue is one of what the appropriate planning horizon is, while the economic issue is one of specifying the behavioral assumptions most appropriate for the selected period. In this study the planning period was specified to be a year, largely because major planning and budget allocation decisions are made on an annual basis. In conjuction with this, it was assumed that total quantities available for market were given for the period and not subject to change in response to prices or other economic determinants. Thus, it is assumed that quantities are given and the price mechanism makes the necessary adjustments to allocate the fixed quantities among alternative outlets or

uses. Consequently, there is implied a complete system of inverse demand functions which express each price as a function of all of the given quantities and income. Thus, from a theoretical viewpoint, the interdependence among the various commodities and prices can be correctly represented by a complete matrix of price flexibilities.[1]

An additional assumption regarding economic behavior in the market is that the existing demand for commodities is independent of Government program activities. Essentially, this says that Government purchase activity largely operates outside the regular market channels, and therefore has a negligible effect on existing demand. While this assumption is consistent with the wording and intent of the legislation, its reality is an open question.

A final economic consideration is the calculation of benefits, or the impact of the various purchases. This includes deciding which beneficial impacts are to be considered, and at what level in the system. Indeed, it raises the more basic question of what constitutes a benefit. In the present study a pragmatic approach was adopted which does not purport to give a definitive answer to this fundamental question. The approach is based primarily on the implied program objective of enhancing price or income to the commodity subsectors. Briefly, given the particular purchase strategy specifying commodities and expenditures, an attempt is made to calculate a measure of dollar benefit and impute an allocation by geographic region and farm income class.

A list of administrative considerations having some relevance in the operation of programs such as Section 32 could probably be extended indefinitely. As in the present study, the delineation can be narrowed substantially by selection of the specified annual time period and by focusing on the plan-selection part of the planning-decision process, as opposed to implementation and evaluation. The list includes the program decisions and constraints mentioned previously, in addition to the following important considerations.

A major consideration is the selection of a decision rule or criterion that can be used as a basis for developing alternative plans among which a choice can be made. A necessary condition in selecting such a rule is that it be directly related to the objective or goal to be achieved. When more than one objective exists, either explicitly or by implication, the selection of a single rule is open to choice. This is the situation in the present problem. That is, it is not clear whether major emphasis should be focused on relative commodity price levels or on returns to producers. Thus, in developing a pilot model two alternative criteria were used. The first focuses on the price level, relating the expected commodity price to a "normal" price, based on a historic moving average of the price of that commodity. The second focuses on the returns to the producer and selects among eligible commodities on the basis of a "farmer's share" concept.

One of the most important considerations in developing a model to aid in this type of administrative decision process is the recognition that a formal model cannot capture all relevant aspects of the decision process. The factors are too numerous, and many of them are either qualitative or lack precise definition, so that they cannot be formally introduced in a model. Such factors would include possible conflict with other programs, agencies, or administrative policies, in addition to adverse political repercussions.

The existence of these factors has important implications for developing a formal system to aid in the decision process. For example, their existence argues strongly against the use of a strict optimizing framework since it purports to come up with a single plan which is "best," even though many factors have not been taken into account. Rather than a framework that attempts to select a single optimum plan, one needs a framework which will generate alternative plans and indicate the tradeoff between them. Selection among these alternatives can then be made in view of the qualitative and other factors not formally included in the model.

A Two-Stage Model

The two-stage model is an annual, deterministic, simulation model which attempts to capture in a mathematical framework the essential quantitative aspects of the planning-decision process undertaken each year by AMS regarding surplus commodity removal under Section 32.[2] It provides a systematic means for developing and evaluating the probable effects of alternative purchase strategies which take into account the program objectives, constraints, and economic considerations. The system is called a two-stage model because it treats the decision process in two sequential stages. A flow chart depicting the basic logic of the model is presented in figure 1.

To facilitate understanding of the model we will first present a brief overview describing what it does and subsequently turn to a more detailed discussion of its structure.

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[1]Following Houck (*2*), flexibilities are defined as the elements of the inverse of the matrix of demand elasticities.

[2]For a discussion of simulation techniques and definitions, see (*4*).

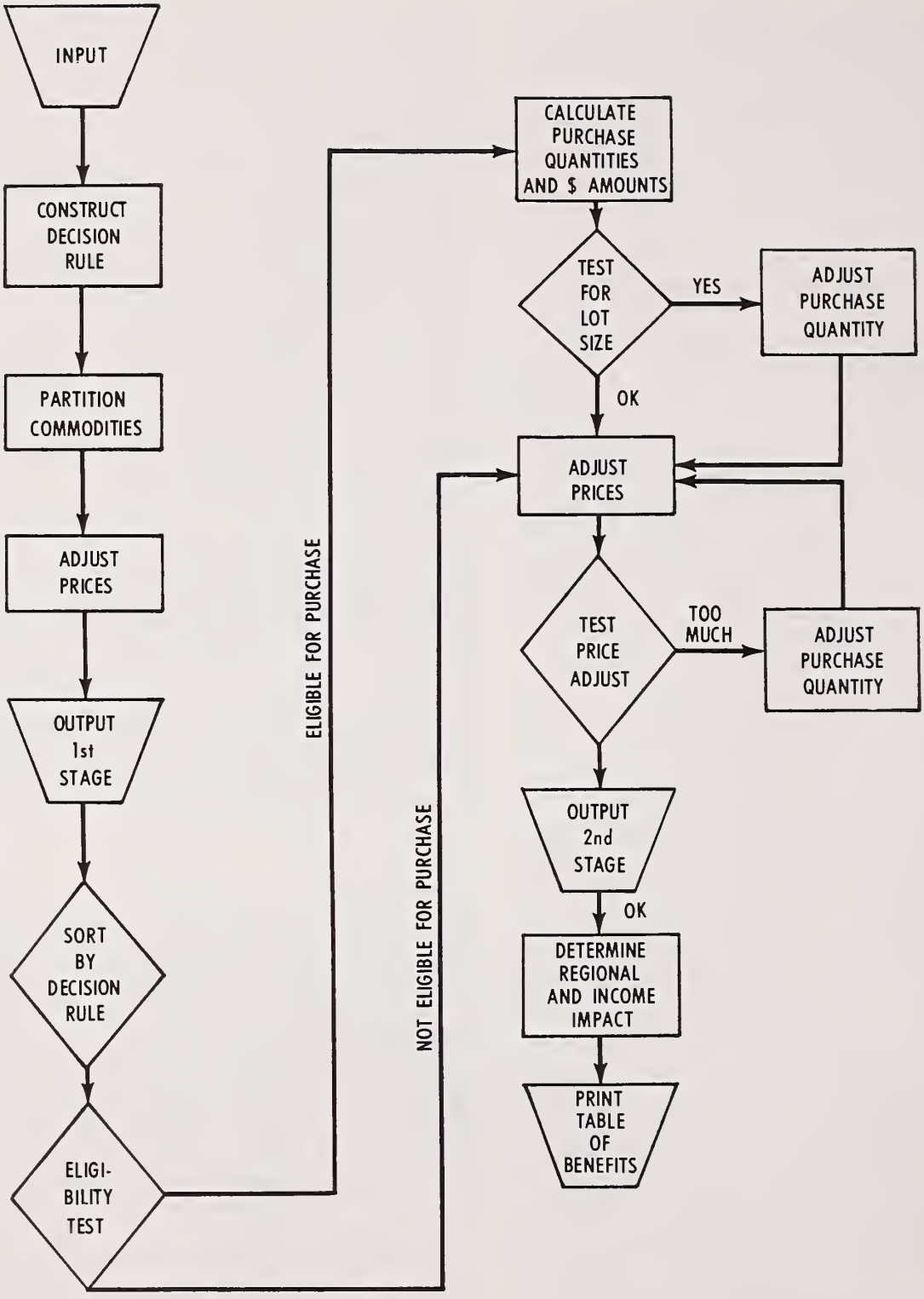

Figure 1. Flowchart of the model.

The set of potentially eligible commodities, the various constraints, and the basic criterion or decision rule for allocating funds to the purchase of specific commodities, are determined outside the model.

Given these specifications, the first stage of the model considers those minimum purchases necessary to meet nutritional and other requirements specified by FNS for the food distribution programs supported by Section 32 funds. These requirements are specified as minimum quantities for groups of similar commodities. For example, a group might be canned vegetables and include corn, peas, green beans, and others. The first operation allocates these minimum group quantities to individual commodity purchases via the specified decision rule used to rank commodities. No fund- or price-oriented constraints are effective in the first stage. Next, all prices at the farm and wholesale levels are adjusted for the effect of purchases of these individual commodities, and the output for the first stage is printed.

In the second stage the commodity group classifications are eliminated and the individual commodities are ranked by the specified values in the decision rule. Given this ranking, purchase eligibility for a given commodity is determined by comparing the adjusted forecast farm price (from the first stage) with the average price. The amount of total funds that can be spent on each eligible commodity and the amount (tons) of each to be purchased are then calculated. Effective constraints at this point are: (1) total funds cannot be exceeded, (2) no more than 25 percent of total funds can be spent on any one commodity, and (3) specified maximum quantities which can be used in food distribution programs cannot be exceeded. A lot-size requirement, effective only for fruits and vegetables, is also checked at this point. It specifies that enough of the given commodity must be purchased to permit national distribution.

Farm prices are then adjusted for the effects of the second-stage purchases and these adjusted prices are again compared with the average farm price. If the ratio of adjusted farm price to average farm price exceeds the specified value, the purchase quantity is reduced until this condition is satisfied. The resulting quantities are then used to adjust all wholesale prices which in turn are used to examine the funds-oriented constraints.

Given the quantities and adjusted prices which satisfy all the constraints, a dollar benefit is calculated and imputed to geographic regions and to farm income classes.

Components of the Model

The set of commodities. As mentioned previously, the set of eligible commodities is prescribed by the authorizing legislation, past experience of AMS, and considerations related to the food distribution programs. The authorizing legislation sets the broad limits, in that funds are to be used principally for perishable, nonbasic commodities which are not price supported. Past purchase history and knowledge about the spectrum of commodities serves to further narrow the list of commodities. Considerations with respect to the food distribution programs have more of an effect on product specifications than the general set of farm commodities per se. Although it is possible, say, through the lot-size restriction, to preclude a minor commodity, the major effect of these considerations is to expand the number of commodities specified at the purchase level over the number of farm level commodities. For example, the farm level commodity might be beef, while at the purchase level there may be alternative product forms such as fresh beef, frozen beef, and canned beef, and each may come in several container sizes.

The objectives. In developing a decision model, the program objectives play a crucial role in determining the criterion on which decisions are made. For example, in the early stages of the present study a linear programming model was developed in which the main objective was to maximize gross returns at the farm level. Thus, the so-called "objective function" which is maximized has a "gross per unit farm return" concept for each commodity as the criterion for choosing among commodities.

In the present simulation model an objective function is not required for maximization purposes, but similar criteria are needed for ranking or weighting as a basis for selecting among commodities in such a way as to enhance the major objectives of the purchase activities. These criteria are referred to as "decision rules." Since the legislation did not specify whether the objective was stabilization and enhancement of farm price or enhancement of farm income, the model was developed using each alternative. These two alternatives are referred to as rule 1 and rule 2.

Rule 1 relates to the price objective, and rule 2 to the income objective. Rule 1 is closely related to the price eligibility criterion discussed in the following section and is treated more fully there. For each commodity an estimate of the farm share of each dollar spent is used as a basis for ranking under rule 2.

Price eligibility. This concept plays an important role in the model. Its introduction in the model rests on the implied program objectives of price stabilization and enhancement and their relationship to surplus removal. The presumption is that a direct relationship exists between a surplus condition for a commodity and the degree to which its price is depressed. The extent to which a given price is depressed is determined by comparing the forecast farm price to a moving average price for that commodity, where the length of the moving average varies from 3 to 5 years depending on the commodity. Specifically, the relationship in the model is:

$$(1)\quad PDUD = (PN_i \cdot PFACT) - FP_i$$

where

$PDUD$ = test value
PN_i = moving average farm price for commodity i
$PFACT$ = factor which is used to specify the proportion farm price should be of average price
FP_i = forecast farm price for commodity i.

If the primary objective of surplus commodity removal is specified to be price stabilization and enhancement, then a relationship similar to (1) can be used to determine the weights for the primary decision rule used to rank commodities. In this case, commodities with the most depressed price would be given a higher priority for purchase. The formulation which incorporates this specification is rule 1.

Irrespective of the objective specified, however, the price eligibility relation (1) enters the model as a constraint to which all discretionary purchases (stage 2) are subjected. That is, a commodity is eligible for purchase if *PDUD* is greater than zero, which says that the forecast farm price is less than a specified proportion of its average price in some historic period. On the other hand, if *PDUD* is less than zero, the commodity is not eligible for purchase.

This procedure has some intuitive appeal from the administrative decisionmaker's point of view. First, it relates decisions to actual behavior of a commodity sector. Second, it permits introduction of knowledge the decisionmaker may have about the commodity sector. For example, *PFACT* can be changed in cognizance of long-term price changes that reflect shifts in relative commodity price positions. Later we consider an example in which *PFACT* = 1.1, permitting prices to be greater than their average. If desired, *PFACT* could be defined in terms of parity.

Price adjustments. Incorporation of price adjustments is a central feature of the model in the sense that it constitutes the focal point for capturing the important economic considerations, especially the economic interdependence between commodities and between market levels. The link between market levels is important for the determination of farm price adjustments and of price adjustments at the marketing stage at which commodities are purchased with Section 32 funds. The latter is relevant in the determination of total expenditures which cannot exceed budgeted outlays.

The dependence between commodities is taken into account through the use of a complete matrix of direct and cross price flexibilities for Section 32 commodities. This matrix was derived from a larger matrix of retail demand elasticities developed by George and King (*1*). The specific matrix was derived from the larger matrix by aggregating the elasticity parameters for commodities not explicitly considered in Section 32, using a procedure that maintained the four restrictions on the original set of parameters. The collapsed matrix of elasticities was subsequently inverted to obtain the matrix of direct and cross flexibilities at the retail level. This procedure is adequate as long as the original matrix contains all of the specific commodities of interest. If not, as in the present case, the parameters for the additional commodities must be obtained by some alternative procedure. In developing the present prototype model, a rather arbitrary ad hoc procedure was used in which the missing commodities were assigned magnitudes for flexibilities identical to those for closely similar commodities.

To obtain a conceptually consistent set of parameters at the farm level showing the cross-commodity interdependence, the concept of elasticity of price transmission (*3*, p. 111, and *1*, p. 61) was employed to construct a farm level matrix of price flexibilities from the retail flexibility matrix. The elasticity of price transmission is defined as the ratio of the relative change in retail price to the relative change in farm price. It does not require the assumption of constant percent or constant dollar margins. The relationship of flexibilities is:

$$(2)\quad F_{ij} = RF_{ij}(1/N_j)$$

where

F_{ij} = farm level flexibility between the ith price and the jth quantity
RF_{ij} = retail level flexibility between the ith price and the jth quantity
N_j = elasticity of price transmission for the jth commodity.

For the purposes of developing the prototype model it was assumed that the elasticity of price transmission was unity between retail and the level at which purchases are usually made. Thus, the retail price flexibilities are assumed to be applicable at the wholesale or purchase level.

Price adjustments are made in both the first and second stages of the model. These adjustments take account of the effect a given commodity purchase has on the price of that commodity and on all other Section 32 commodities. Specifically, for the wholesale or purchase price adjustment, the relationship is:

$$(3)\quad APW_i = PW_i \left(1 + \sum_{j=1}^{n} F_{ij} q_j \cdot C_j/Q_j\right)$$

where

APW_i = adjusted wholesale price of commodity i
PW_i = wholesale price of commodity i
q_j = farm level of commodity j purchased
C_j = conversion factor from processed to farm weight
Q_j = total quantity of commodity j available for market
F_{ij} = price flexibility between the ith price and the jth quantity
n = number of commodities.

The relationship for price adjustments at the farm level is essentially the same.

Operation of restrictions and constraints. Because of the sequential nature of the model, a certain ordering of constraints exists and some restrictions are only operative in one stage.

The minimum commodity group requirements might be termed mandatory purchases in the sense that AMS must purchase these minimums regardless of the price. These group requirements are partitioned to individual commodities based on weights assigned to commodities by the specification of a given decision rule. Maximum restrictions apply to individual commodities. When the maximum purchase for a given commodity has been reached in the first stage allocation, but the group minimum has not been met, purchase is shifted to the commodity with the next highest rank according to the decision rule used. This continues until the group requirement is met.

Second-stage purchases might be termed discretionary purchases in the sense that there is more latitude of choice between specific commodities and the respective quantities. However, as a result, more considerations become effective as constraints. The focal point of the second stage is the determination of which discretionary commodities to purchase and the level of expenditure on each. This is accomplished through the use of the two funds-oriented constraints and in some cases the lot-size constraint. The first funds constraint restricts total expenditure to be less than or equal to total available funds, while the second states that expenditure on any one commodity cannot exceed 25 percent of total funds. If an individual commodity has a lot-size requirement it is checked at this point and the purchase is adjusted to meet it. Price adjustments are made at this juncture and another constraint is introduced which says that the adjusted farm price cannot exceed a given proportion of the average farm price. Should this restriction be violated, the purchase quantity is reduced by 10 percent and a new adjusted price is calculated. This iterative procedure continues until the adjusted farm price is less than or equal to the specified average price factor, and then the lot-size requirement is checked again.

Calculation and allocation of benefits. Benefits are calculated after a purchase plan has been formulated which conforms to the various constraints and objectives. Given a purchase plan, two measures of dollar benefits are calculated. One measure, called the price impact, is the product of the quantity of a commodity remaining on the market times the price change for that commodity, summed over all commodities. This total calculated benefit is then allocated by both geographic region and farm income class, based on an imputation procedure which uses census data on commodity distribution by region and income classification. Another measure, called return to producers, is based on the estimates of the farmer's share. It is calculated as the product of the farmer's share times the total expenditure for each commodity, summed over all commodities.

Data requirements. Since the data requirements for the model are quite extensive, it may be useful to summarize them at this point. Data requirements are essentially of two types: that which is commodity specific and that which is not. The former category contains the bulk of the data requirements as indicated in the following list:

1. Commodity name and description
2. Forecast farm price
3. Moving average farm price
4. Wholesale price
5. Total quantity available
6. Processed-to-farm-weight conversion factor
7. Farmer's share

8. Lot-size constraint
9. Maximum quantity constraint
10. Percent distribution of sales by region and income class
11. Direct and cross flexibilities at farm and purchase level.

The second category contains the following:

1. Specification of commodity groups
2. Specification of minimum quantities for commodity groups
3. Total funds available
4. Specification of values to be used in the decision rule for ranking purposes.

Also, an additional fund variable has been added for use if the model is being run for only a subset of the purchase program, such as the School Lunch Program.

Example of Results

To demonstrate the use of the model, a hypothetical problem was developed around the requirements of Section 32 commodity purchases for the School Lunch Program. Several variations of this problem were executed to illustrate the effect of different decision rules and constraints and also to illustrate the usefulness and flexibility of the model as an aid in the planning-decision process.

It is recognized in this example that the decision model deals explicitly only with one set of objectives of the School Lunch Program, namely that of encouraging the domestic consumption of nutritious agricultural commodities. The broader concerns for safeguarding the health and well-being of the Nation's children could be incorporated into an expanded model, but the complexities of the additional constraints precluded handling the complete matrix of decisions facing this program in one example.

The problem example is formulated for 12 commodities which have been purchased in past years for the School Lunch Program. Data were obtained from the Section 32 program budget for fiscal year (FY) 1972 and from information supplied by individual commodity analysts. The total Section 32 funds for commodity procurement in FY 1972 were approximately $300 million. Of this, about $90 million was allocated to the School Lunch Program. Specified minimum commodity group requirements (in tons) were 18,750 for dry beans, 34,450 for red meat, 17,500 for turkey, and 13,150 for canned fruits and vegetables. These minimum requirements for the 12 commodities appear in table 1 as mandatory purchases in the first stage.

Alternative Specifications

Given the above program specifications, several alternative specifications of the model were employed. In each case two alternatives were used for the major decision rule. They are designated rule 1 and rule 2 in table 1.

Rule 1 employs a ratio of forecast farm price to a moving average price (called "normal price") as a basis for assigning relative weights to commodities for ranking purposes. This criterion is used to reflect the program objective of supporting commodities for which a surplus is indicated by depressed prices. The ratio (DP_i) is defined as

$$(4)\quad DP_i = (PN_i \cdot PFACT)/FP_i$$

where the variables on the right side are as defined in equation (1).

Rule 2 employs a computed value of farmer's share for each commodity as a basis for ranking. This measure was selected to reflect the program objective of enhancing farm income through the purchase of surplus commodities by assigning a higher ranking to those commodities for which the producer received a higher proportion of each dollar spent.

For each of these decision rules, three alternative runs of the model were made in which specific constraints were altered. The first run (RUN 1) had the price eligibility constraint (*PFACT*) set at 1.0, which specified that a commodity's price could not exceed its average or "normal" price. The second run (RUN 2) set the value of *PFACT* = 1.1, permitting a commodity to be eligible for purchase as long as its price did not exceed its average price by 10 percent or more. In the third run (RUN 3) a minimum purchase was specified for potatoes, to demonstrate the effects of specifying the purchase of a commodity that did not enter the solution initially. The value of *PFACT* is kept at 1.1 as in RUN 2.

The following discussion of the numerical results of the three different runs focuses, in turn, on (1) a comparison of the purchase plans and effects of the two alternative primary decision rules, (2) the effect of changes in level of the price eligibility constraint, and (3) the tradeoffs that result from imposing the purchase of a given commodity which was not initially selected for purchase. For each case, the discussion centers on two major effects, namely those for commodity mix and those relating to expenditure impacts or benefits.

Table 1. Two-stage model results for alternative specifications based on School Lunch Program

Item	RUN 1				RUN 2				RUN 3			
	Rule 1		Rule 2		Rule 1		Rule 2		Rule 1		Rule 2	
	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Beef	–	–	34,450	–	–	–	34,450	–	–	–	34,450	–
Pork	34,450	–	–	–	34,450	–	–	11,611	34,450	–	–	8,014
Turkey	17,500	–	17,500	–	17,500	–	17,500	7,500	17,500	–	17,500	7,500
Chicken	–	–	–	–	–	–	–	–	–	–	–	–
Eggs	–	4,000	–	4,000	–	4,000	–	4,000	–	4,000	–	4,000
Peas	–	–	–	–	–	8,857	–	–	–	7,972	–	–
Potatoes	–	–	–	–	–	–	–	–	10,000	–	10,000	–
Dry beans	18,750	–	18,750	–	18,750	–	18,750	–	18,750	–	18,750	–
Pears	–	–	13,150	–	–	10,000	13,150	–	–	2,500	13,150	–
Peaches	–	15,000	–	15,000	–	15,000	–	–	–	15,000	–	–
Apples	13,150	2,500	–	15,000	13,150	2,500	–	–	13,150	2,500	–	–
Tomatoes	–	15,000	–	–	–	15,000	–	–	–	15,000	–	–
	Mil. dol.		*Mil. dol.*		*Mil. dol.*		*Mil. dol.*		*Mil. dol.*		*Mil. dol.*	
Price impact	213.92		151.16		232.16		206.28		232.77		193.80	
Return to producers	33.92		44.23		35.85		50.44		35.74		49.61	
Funds expended	79.48		85.91		88.44		90.06		87.87		90.04	
Benefit-cost ratios:												
Price[1]	2.70		1.76		2.63		2.29		2.65		2.15	
Return[2]	.43		.52		.41		.56		.41		.55	

[1]Ratio of dollar price impact to dollar expenditure.
[2]Ratio of imputed direct returns to producers to total expenditure.

Alternative Decision Criteria: RUN 1

The major effects of using the different decision rules can be seen by examining RUN 1 in table 1 and comparing the results for rule 1 with rule 2.

Commodity mix. In examining the commodity mix under the two rules it is useful to note the effects in both first- and second-stage purchases. For RUN 1, first-stage purchases differ with respect to the allocation within the red meat group and within the canned fruit and vegetable group. In the red meat group under rule 1, which ranks commodities by the extent to which each commodity's price is depressed, the minimum is satisfied by purchasing pork, because its price is low relative to beef. Under rule 2, which ranks commodities by farmer's share, the minimum is filled by purchasing beef, because of its higher farmer's share. For the same reason, under rule 1 apples are purchased, whereas pears are used to satisfy the minimum under rule 2.

With respect to the second-stage discretionary purchases in RUN 1, the commodity mix differs only in the canned fruit and vegetable group. Under rule 1, tomatoes are purchased because of a relatively low price, whereas under rule 2 they are not purchased because they have the lowest farmer's share. Also, an additional 2,500 tons of apples are purchased in the second stage under rule 1 because apples have the most depressed price. This results in the purchase of 650 tons more apples than under rule 2.

Commodity price effects. The proportion of total

Table 2. Price changes for RUN 1

Commodity	Rule 1			Rule 2		
	Quantity removed	Farm level	Retail level	Quantity removed	Farm level	Retail level
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Beef	0.00	.408	.247	.33	.880	.575
Pork	.59	2.606	1.529	0.00	.224	.151
Turkey	2.06	2.020	1.517	2.06	1.892	1.450
Chicken	0.00	.711	.455	0.00	.459	.324
Eggs	.07	.441	.313	.07	.414	.294
Peas	0.00	.913	.840	0.00	.356	.268
Potatoes	0.00	.002	.026	0.00	.019	.021
Dry beans	.99	4.789	4.393	.99	4.464	4.062
Pears	0.00	-.029	-.015	2.45	5.100	3.224
Peaches	.84	1.714	1.087	.84	1.741	1.101
Apples	.65	1.326	.841	.62	1.293	.818
Tomatoes	.46	3.541	3.680	0.00	.902	.764

quantity removed in RUN 1 and the resulting price changes for each commodity under the two decision rules are shown in table 2. The relative price changes represent the effects of purchases on the initial forecast price for each commodity. These price effects are generated by the price adjustment mechanism discussed earlier which utilizes a matrix of direct and cross price flexibilities. As pointed out there, a procedure which maintains the original restrictions on the parameters is used for aggregating commodities that are not of specific interest. But where specific commodities of interest are not contained explicitly in the original matrix, a somewhat arbitrary, ad hoc procedure was used to obtain flexibilities for the prototype model. Specifically, in the present example, canned pears and apples were assigned values for direct price flexibilities identical to those for canned peaches because the former were not explicitly contained in the original matrix. One difficulty in this procedure is the omission of the cross effects among these three commodities.

Perhaps the most important fact to note is that, irrespective of the decision criteria used, the prices of all commodities are affected whether a commodity is purchased or not. Recognizing the questionable realism of some of the flexibilities, the implications of this interdependence can be illustrated by the results for specific commodities. For example, under rule 1 no pears are purchased, but the effect of other purchases is to decrease the price of pears. In this case the decreased price is a direct result of the purchase of pork. Pork has a positive cross flexibility with pears that is larger than the total effect of other cross flexibilities that are negative. Viewed another way, the tradeoff, or part of the "price" one pays for buying pork, is the reduction in the price of pears.

Another example, which has the contrary effect, is worth noting. The initial forecast price of chicken was approximately 60 percent greater than the "normal" price. Further, under the two rules meat and poultry purchases differ only with respect to pork and beef, the former being purchased under rule 1 and the latter under rule 2. Yet the price of chicken is increased in each case even though no chicken is purchased. However, the effect on the price of chicken is about 50 percent greater under rule 1 than under rule 2. Also, under rule 1 the effect on the price of beef when no beef is purchased is an increase of 0.408 percent, while under rule 2 where beef is purchased, the effect on pork price is an increase of 0.224 percent. Thus, in terms of tradeoffs, one might say that part of the "price" one pays for buying pork or beef is the increase in the price of chicken, the tradeoff being about 40 percent greater for pork than for beef. Moreover, this example shows that if one wants to decrease the impact of purchases with respect to increased prices, rule 2 is a better decision criterion than rule 1.

Overall impacts. The two different decision rules with their corresponding purchase plans lead to some

important differences in overall impacts. At the bottom of table 1, three measures of dollar impact are presented. The price impact measure is the product of the change in farm price resulting from purchases, times the total supply of the commodity left on the market, summed over all commodities. Funds expended are the product of quantity purchased times the initial price plus one-half of the price change resulting from purchases, summed over all commodities. Imputed returns to producers are calculated by multiplying total expenditure for each commodity by its respective farmer's share and summing over commodities.

Under rule 2, funds expended were about $6.4 million higher than under rule 1, primarily as a result of purchasing beef. The price impact of this larger expenditure under rule 2 is about 30 percent less than that for rule 1, but the imputed returns to producers under rule 2 are about 30 percent larger. Under both decision rules all eligible commodities were purchased without exhausting the total available funds.

As a summary measure for comparison among the various alternatives, the ratio of the dollar price impact to the dollar expenditure might be used as a benefit-cost measure. Another measure is the ratio of imputed direct returns to producers to total expenditure. These ratios appear at the bottom of table 1.

Still another way of looking at the tradeoff is to compute the relative change in impact for a 1 percent change in expenditure as we change from rule 1 to rule 2. For example, in RUN 1, on the average, a 1 percent increase in expenditure in switching from rule 1 to rule 2 results in a 4.4 percent decrease in the dollar price impact and a 3.4 percent increase in the imputed direct returns to producers. Similar comparisons can be made to determine the tradeoff between the purchase plans for a given rule under the different specifications of each RUN.

Distribution of price impact. Program administrators often need some assessment of the relative impact program planning decisions may have on different groups. For illustrative purposes, the dollar price impact generated by the model for each commodity was used in conjunction with distribution data from the 1964 Census of Agriculture to impute a distribution of the price impact by geographic region and farm income class for each of the decision rules in RUN 1. The proportion of the dollar impact is imputed to six geographic regions and five income classes (table 3).

A basic assumption underlying this allocation procedure is that the designated commodities are homogeneous with respect to region and income class. Obviously this is more valid for commodities such as turkey than it is for peaches, since the latter includes more than one variety, each of which may be specific to a given region.

Table 3. Distribution of price impact by region and income class for RUN 1

Item	Rule 1	Rule 2
	Percent	*Percent*
Region:[1]		
West North Central	39.50	31.09
East North Central	23.67	13.77
West	14.75	27.77
South Central	11.28	17.29
South Atlantic	7.61	6.11
Northeast	3.18	3.98
Income Class:		
$40,000 and over	44.71	66.22
$20,000 to $39,999	22.32	15.99
$10,000 to $19,999	18.55	9.73
$5,000 to $9,999	9.50	4.82
0 to $4,999	4.93	3.25

[1]Regions are defined as follows: (1) Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas; (2) Ohio, Indiana, Illinois, Michigan, Wisconsin; (3) Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, Hawaii; (4) Kentucky, Tennessee. Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas; (5) Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida; and (6) New England, New York, New Jersey, Pennsylvania.

Although the distribution data on commodities by region and income class are crude, it is nevertheless instructive to examine the implications of this allocation, since it does provide a reasonably meaningful indication of the distribution of the effects of alternative planning decisions. For example, the figures demonstrate the regional shift in benefits that occur when red meat purchases are switched from beef under rule 2 to pork under rule 1. The percentage allocation of benefits declines in the South Central and West regions, which together account for 47 percent of beef production but only 10 percent of pork production. These alternative purchase strategies also affect the distribution among income classes. The purchase plan under rule 2 skews the distribution of benefits toward the highest income class, whereas the plan under rule 1 distributes benefits more evenly. And, under either alternative, more than 40 percent of the benefit is allocated to the highest income category.

Changes in Price Eligibility: RUN 2

RUN 1 specified PFACT of equation (1) to be equal to unity, which essentially states that a commodity is

not eligible for purchase if its price is equal to or greater than its normal price. RUN 2 sets *PFACT* = 1.1, making the price eligibility constraint effective at 10 percent above a commodity's normal price.

Commodity mix. Obviously, first-stage purchases remain the same under both decision rules when the price eligibility constraint is increased. Second-stage purchases, however, are altered in that additional commodities are purchased under both decision rules.

Under rule 1 an additional 8,857 tons of peas and 10,000 tons of pears are purchased. Canned peas were eligible for purchase in RUN 1, but purchase of the minimum lot-size forced the price above normal, and the next most eligible commodity, tomatoes, was purchased. In RUN 2, the model continues to purchase tomatoes and then proceeds to purchase pears, which is the next ranked commodity.

Under rule 2, the commodity mix is altered more drastically in that funds are shifted away from canned fruits and vegetables in favor of red meat and poultry. The second-stage purchases of canned peaches and apples in RUN 1 are dropped in favor of an additional purchase of turkey and pork. For red meat, the first-stage purchase is filled with beef as in RUN 1, because of its higher farmer's share. This purchase forces beef price considerably above the eligibility constraint, precluding additional purchase in stage two. The next ranked commodity is pork, but because its forecast price was slightly above the normal price it was not purchased in RUN 1. However, increasing the price eligibility constraint leads to the purchase of 11,611 tons. Similarly, the increase in price eligibility leads to an additional purchase of turkey.

Overall impact. Comparison of the dollar impact measures for RUN 1 and RUN 2 reveals an increase in each measure, the price impact being rather substantial for rule 2, which also expends the total funds available. Under rule 1 both benefit-cost ratios decline from RUN 1 to RUN 2, while both increase under rule 2. Again, these ratios provide an indication of the tradeoff between the various rules and constraints which can then be used as a basis for program purchase decisions.

Changing Required Purchases: RUN 3

RUN 3 is formulated to illustrate how the model can be used to evaluate the effect of imposing a requirement that a given commodity, which does not appear in the initial plan, be purchased. *PFACT* is set equal to 1.1 for comparison with RUN 2, and a minimum potato purchase of 10,000 tons is imposed for stage one.

Commodity mix. Except for the imposed purchase, first-stage purchases are unchanged. In the second stage, the commodity mix remains unchanged from RUN 2 for either decision rule, but the quantity purchased of some commodities is reduced. Under rule 1 the quantity of peas purchased decreased slightly and the quantity of pears purchased decreased substantially. Under rule 2, the only change was a reduction in the quantity of pork scheduled for purchase. Thus, the effect of the imposed potato purchase was to substitute potatoes for pears and peas under rule 1 and pork under rule 2.

Overall impact. Changes in the magnitudes of the overall impact measures were mostly negligible. The largest change occurred under rule 2, where the price impact decreased by $12 million, but the effect on the corresponding benefit-cost ratio was small. Thus the major effect of the imposed potato purchase was to substitute potatoes for other commodities and under rule 2, to reduce the price impact of a given expenditure.

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Tax-Induced Investment in Agriculture: Gaps in Research

By Kenneth R. Krause and Harvey Shapiro

Estimated individual income tax subsidies to agriculture approximate $1 billion annually. The more important provisions of the Internal Revenue Code and regulations that permit the subsidies are described and analyzed. The economic impact of the subsidy plus unmeasured subsidies to corporations are unknown in terms of resource allocation, price, income, supply, and structural effects. The most critical gaps in quantitative effects of the subsidies in terms of the Treasury Department and congressional tax writing committees are highlighted. Needed research by agricultural economists and possible approaches to such research are suggested in this survey article.

Keywords: Income taxes; Research needs; Subsidies; Tax loss farming.

A recent study of Federal subsidy programs estimated the gross budgetary costs of the Federal Government's fiscal 1970 agricultural subsidies at $5.2 billion (*31*, p. 87). The report identified the 18 separate programs whose individual costs accounted for this total. The second largest "program," costing an estimated $880 million, was agricultural tax subsidies in the form of expensing and capital gains.[1] With indications ahead for sharply reduced direct subsidies to agricultural production, income tax subsidies may become the largest single subsidies to agriculture.

The commentary accompanying the estimates contained the following statement regarding the farm tax subsidy: "It is not clear how the tax subsidy . . . relates to agricultural production" (*31*, p. 87).

This statement points to a serious gap in available knowledge regarding the impact of Federal income tax variables on American agriculture, at least in the minds of members of the Joint Economic Committee of Congress. An incentive that costs the Federal Treasury nearly $900 million in tax revenues in a single year probably has some important effects on agricultural input and product prices, income, consumer prices, and the structure of U.S. agriculture. Yet the subject has apparently been largely ignored in both empirical and policy contexts.

In the Department of Agriculture and in the academic community little research effort has been devoted to this subject. Answers to policy questions generated by such nonagricultural sources as the Treasury Department and congressional personnel interested in tax reform are now required. Most of the response to legislative activity has come from special-interest lobby groups.

Notes are on page 21.

This article describes the more important tax provisions affecting agricultural investment, discusses the possible economic implications, reviews what statistical information is available, points to gaps in our knowledge, and indicates some questions in need of answers.

Agricultural Tax Accounting

Income or loss from farming may be computed under more liberal accounting rules than are generally applicable to nonfarm businesses. For nonfarm businesses the cost of an asset, including maintenance of the asset prior to its being used in the business, is considered a capital expenditure. It may not, therefore, be deducted as incurred but may be recovered only by depreciation over the useful life of the asset. In this manner, the cost of the asset is matched with the income earned by it.

A 1919 Treasury Regulation, however, permits agricultural producers to deduct some capital costs as they are incurred (*34*). For example, expenditures associated with the raising of livestock held for breeding purposes are capital expenditures, but they are deductible currently. Similarly, a grove of most types of fruit or nut trees may not bear a commercial crop for several years after it has been planted, but all the post-planting costs of raising the grove to a producing state (except for citrus since 1970 and almonds since 1971) may also be deducted when incurred.

Of equal importance, a second Federal income tax regulation allows agricultural producers to be exempt from the general rules regarding inventory accounting. The exemption is based on a 1915 administrative decision by the Commissioner of Internal Revenue (*33*). Even in cases where inventories are a material factor,

farmers have historically been permitted to use the cash accounting method and to ignore their year-end inventories of crops, cattle, and so on. This also results in an inaccurate reflection of annual income when expenditures are fully deducted in the year incurred, but the assets produced by those expenditures (inventories) are not sold and the income not reported until a later tax year.

While these liberal deviations from accounting practices required of other businesses are permitted for farm operators, they may choose to use accrual accounting for income tax reporting purposes. The accounting variations are permitted by regulations issued by the Treasury Department rather than by legislation (*33*). Congress liberalized the tax treatment of agricultural producers in 1951 by expanding the category of assets used in a trade or business and entitled to capital gains treatment upon sale to include livestock held for draft, breeding, or dairy purposes (*35*). The Tax Reform Act of 1969 added livestock held for sporting purposes to the relevant section of the Internal Revenue Code (*2*, *36*, *38*).

Different Views of Preferred Tax Treatment

Opposing arguments exist concerning the reasons for special tax concessions. One view contends that the special agricultural rules were a deliberate effort to recognize the importance of agriculture to a strong dynamic national economy. Thus, according to one author, the Federal Government has recognized the volatile nature of the beef cattle industry and offered certain tax shelters and subsidies to attract investment capital for building up the quality and quantity of U.S. beef cattle (*25*). Some people interested in investments in other agricultural enterprises, such as fruit and nut orchards or race horses, espouse similar arguments.

Another view holds that farm producers have been permitted to use cash accounting and ignore year-end inventories because nearly 60 years ago it was believed that farmers were incapable of complying with accounting methods required of other businesses and that accounting principles were too unsophisticated to cope with livestock accounting (*6*, p. 2). Still another view asserts that the underlying rationale for this concession no longer exists, if in fact it ever did. This view holds that today's commercial farmers no longer need this special treatment and, in fact, frequently keep two sets of records: cash-basis accounts for income tax purposes and at least modified accrual-basis records for farm business analysis purposes.[2] If large numbers of farm operators are using or could use accrual accounting methods and then keep inventory accounts, the argument of those who contend that an accrual system of accounting would be impossible for farmers to use is substantially weakened (*32*, p. 2877).

It may be that accrual-basis books are still too difficult for some farmers. The extent to which nontax-purpose accrual accounting is actually used needs to be determined. In addition, the insights from a careful study and evaluation of the problems of applying accrual accounting to the many different types of farm enterprises are also needed.

Some Resulting Tax Abuses

High-bracket taxpayers whose primary economic activity is other than farm production have invested in fruit and nut tree groves, in breeding cattle operations, in beef feeding, and in catfish growing, to take advantage of the special farm accounting rules. Many of these high-bracket taxpayers incur farm losses for income tax purposes which are largely attributable to the expensing of capital costs (*32*, *33*, *37*). The farm losses, which are deducted from nonfarm income, represent an investment in farm assets rather than actual economic losses. When the asset, which has been expensed, is ultimately sold, it is taxed at capital gains rates. Depreciation that is taken is usually recaptured at ordinary income tax rates.

Thus, the combination of a farm loss deduction against high nonfarm income and the subsequent application of capital gains rates to income from the sale of the farm asset provides a mechanism by which nonfarm investors in farm production can convert ordinary income into capital gains. In short, this practice results first in tax deferral and finally in a partial exemption of income from taxation. With the proper combinations of high marginal tax rates applicable to nonfarm income, "farm tax losses" currently deductible, and capital assets subject to future capital gains taxation, the investor can actually increase his after-tax income. He can do this by investing in certain agricultural activities even if they do not show an economic profit.

The value of deferring taxes increases with the length of the deferral period and the interest rate. Conceptually, one can delay payment of taxes for many years from engaging, say, in cattle feeding, by increasing the size of the feeding operation each year.

The benefit of the capital gains qualification can be illustrated with the following, oversimplified, examples. Assume the feed and other deductible expenses of raising a breeding herd from owned calves are $200,000. If the taxpayer is in the top 70 percent bracket, the current deduction of these expenses will reduce his

current taxes by $140,000. When the herd is sold, the entire sale price, including the $200,000 representing the recovery of these expenses, will be taxable at the 25 percent capital gains rate on the first $50,000 and 35 percent on the remaining $150,000, with the tax being $65,000. Ignoring excess deductions and minimum tax provisions, the taxpayer could realize a $75,000 tax profit ($140,000 minus $65,000) from a transaction which economically broke even.[3]

These tax profits are not necessarily limited to taxpayers whose primary economic activity is other than farm production. Taxpayers whose primary economic activity is farm production, such as ranchers with other profitable agricultural activities such as feeding livestock or growing crops, can also take advantage of the current farm accounting regulations.

Tax-Induced Farm Investment by Nonfarmers

Information regarding the number of breeding cows, vines, and trees owned by investors whose primary economic activity is outside agriculture is not available. Estimates of the magnitude of "tax loss farms," therefore, have to be inferred largely from data reported on Federal income tax returns. In 1970, nearly 1.2 million sole proprietorships reported farm losses on proprietory interests in farming, totaling $2.9 billion (table 1). Farm proprietorship losses of $0.7 billion, or approximately one-fourth of total farm losses reported, appeared on the 72,000 returns with nonfarm adjusted gross incomes of $25,000 or above.

In addition, farm partnerships reported losses of $3.9 million. Information is needed on whom these partnership losses flow to and also on the nature and magnitude of partnership incomes. Furthermore, losses incurred in agricultural production by corporations are not available. Thus, the following inference is based on part of the universe.

Tax losses of the magnitude shown in table 1 clearly indicate substantial flows of money into agricultural production by investors whose primary economic activity is outside agriculture. Taxpayers reporting farm tax losses not only invest their own equity but sometimes borrow several times the amount of the loss in order to obtain the tax loss.[4] Thus, the annual gross magnitude of tax-loss investments by nonfarm investors in agricultural production could conceivably be as high as $10 to $20 billion.[5]

A figure as high as $20 billion, however, is only about 6 percent of $340 billion, the total value of assets in the agricultural sector (*10*). Yet the impacts may focus sharply on certain areas. For example, if nonfarm investors borrow most of the money that they invest in agriculture, they may be responsible for an important part of the $65 billion of agricultural sector debt. Limited formal research effort has been made to obtain

Table 1. Sole-proprietorship Federal income tax returns with farm losses, number of returns, and size of loss, by size of nonfarm adjusted gross income, 1970

Size of nonfarm adjusted gross income	Farm losses								All farm losses	
	Under $5,000		$5,000 to $14,999		$15,000 to $24,999		$25,000 and over			
	Number of returns	Amount	Number of returns	Amount	Number of returns	Amount	Number of returns	Amount	Number of returns	Amount
		Mil. dol.		*Mil. dol.*		*Mil. dol.*		*Mil. dol.*		*Mil. dol.*
Under $5,000	355,402	400.2	19,640	157.9	2,196	37.9	1,358	63.4	378,596	659.5
5,000 to 9,999	371,452	468.9	14,187	105.2	11	.2	154	5.7	385,804	580.0
10,000 to 24,999	385,465	558.0	41,487	306.8	3,154	58.3	490	17.0	430,596	940.1
25,000 to 49,999	32,261	55.6	10,323	82.3	3,079	58.5	1,863	83.5	47,526	279.9
50,000 to 99,999	8,043	13.9	4,937	45.1	2,292	43.4	1,739	77.6	17,011	180.0
100,000 to 999,999	2,133	4.7	1,569	14.5	742	14.8	2,606	189.1	7,030	222.8
1,000,000 and over	9	0.1	21	0.1	15	0.3	65	15.5	110	16.1
All returns	1,154,545	1,501.1	92,164	711.9	11,489	213.5	8,275	451.8	1,266,673	2,878.3

Source: Unpublished Internal Revenue Service data.

an estimate of tax induced investment in agriculture (*1*, *9*, *22*). Such an estimate, however, is very critical in the debate about the importance of nonfarm money that flows into agricultural production and the impact of a loss of such money if the Internal Revenue Code and the regulations were changed.

Economic Implications

Since appropriate data regarding the economic effects of tax-induced agricultural investments are not available for analysis, any evaluation of the economic implications of tax shelter investments in agriculture must be limited to qualitative economic inference.

Misallocation of resources. A recent simulation study by Harrison and Woods investigated the profitability of investing in beef cow herds with or without the special tax provisions of capital gains, net operating loss carryover, income averaging, and offsetting nonfarm incomes with farm losses (*17*). The study simulates a 15-year period and shows that (a) there is no economic incentive for nonfarm investment in commercial herds through management companies without the tax incentives, and (b) even with existing tax provisions, nonfarm investment in beef cow herds is not profitable unless the investor has a marginal tax rate of at least 50 percent. Some management companies indicate that a taxpayer should as a minimum be in the 30 percent marginal tax bracket. The results of the study support the point that some of the nonfarm money that moves into beef cow herds is for "tax profit" purposes and not for normal economic returns, and is thereby a misallocation of investment resources.

No similar study has been made regarding nonfarm investment in orchards.

Price and income effects. In the long run, it can be argued that investment in cattle and orchards by taxpayers whose primary economic activity is other than farming will increase the supply of beef and certain fruits and nuts and thereby reduce the prices of these commodities. Nonfarm investment in farming can increase the demand for farm real estate, breeding and feeding cattle, and fruit and vine stock, thus causing real estate and farm input prices to rise (*7*, *21*). Farmers who own farm assets will find their net worth rising. They may also find increases in their farming costs through a resulting rise in real estate taxes, if local public expenditures continue to be supported from property taxes and if such taxes continue to be assessed on the market value of assets.

The impact of these nonfarm-induced price changes is not uniformly spread across all commodities and is largely confined to certain areas of the country. For example, nonfarm investment was attracted to the citrus-growing areas in Florida for a number of years prior to the 1969 Tax Reform Act, which included a provision that requires capitalization of citrus grove development expenses.

Analysis of the extent of nonfarm-investment-induced price changes is not available.

Price reductions in agricultural commodities affected by tax-induced investment combined with increased expenses can reduce farm income. Estimates of the magnitude of the reduction are not available. Tax-induced nonfarm investment in farming has increased pressure on the income of farm operators without nonfarm income or employment opportunities and may have contributed to the reduction in the number of farm operators in recent years. At the same time, after-tax income of nonfarm investors in agriculture has probably increased as a result of these tax-loss investments.

Changes in agricultural practices. Many animal scientists say that the average biological life of a cow is about 8 years. Tax considerations may affect the average age of the herd that a rancher will maintain, because the proportion of capital gains sales to total sales depends upon the mean service life of cows in the breeding herd. Assuming that the rancher's reactions are proportional to dollar amounts of rewards, the higher his marginal tax rate on ordinary income, the lower will be the mean age of his breeding herd and also his total beef herd.

The tax incentive to sell breeding cows at less than total productive life arises from a combination of two circumstances: the tax law allows the rancher to deduct the expense of raising and maintaining breeding stock against ordinary income, and it allows him to report sales of breeding stock as capital gains.[6]

Let R_o = ordinary income receipts, R_g = capital gains receipts, E = expenses, T = taxes, P = before-tax profit, t = ordinary marginal tax rate, and g = capital gains marginal tax rate. Then $P - T = (1-t)\,R_o + (1-g)R_g - (1-t)E$. From a point where $R_o = E$, every dollar of additional receipts that is shifted from an ordinary to a capital gains computation adds $(t-g)$ cents to after-tax income, that is \$1 of capital gains receipts substitutes for $(1-g)\,(1-t)$ of ordinary receipts in its effect on profit after tax. Since a breeding herd produces about half heifer and half bull calves, a rancher cannot shift more than half of his receipts into a capital gains computation unless he also raises bulls for use in his own operation. Thus, a rancher who is in the 70 percent marginal tax bracket, and who has \$100,000 of receipts and expenses, will show an after-tax profit of \$8,750 if he can shift a quarter of his receipts from an ordinary to a capital gains

classification. His after-tax profit will be $17,500 if he can fully shift receipts so that he shows a $50,000 ordinary loss. He would need $155,000 of ordinary receipts, given expenses of $100,000, to show an after-tax profit of $17,500.[7]

Empirical evidence is needed to determine the extent to which the age-tax considerations actually shorten the serviceable life of breeding livestock, and to determine whether tax loss considerations actually alter conventional practices in other farm commodities.

Structural effects. Tax-loss farming appears to have had several direct effects on the organization of agriculture (*3*; *13*, p. 45-48).[8] nonfarm investors in beef breeding herds or orchards usually use an investment management company, which in turn hires a farm manager. The nonfarm investor may invest in a cow herd and make expenditures for its upkeep only, or he may also invest in grazing and cropland (*25*). Where the investment is only in the breeding herd, farmers and ranchers usually contract to care for the animals, but the major decisions are made by the investment company's farm manager. It is often contended that this decisionmaking arrangement reduces the farmer or rancher to a hired laborer and eliminates his entrepreneurial role. The farmer may make a higher return from contract production than from owned cattle. This arrangement is similar to broiler production under contract where growers are required for labor but not managerial or entrepreneurial roles. Where the nonfarm investor also purchases farm real estate for his herd, farm and ranch owners and operators may be displaced. Some of them will find employment as hired farm laborers, supervisors, or managers. The remaining farm operators and ranchers will find increased competition for farm resources, competition which they may not be able to meet solely from their agricultural derived income.

Structural changes in fruit and nut production attributable to "tax loss" production are similar to changes in cattle breeding. However, nonfarm investors in fruit and nut ventures generally purchase or obtain long-term leases on the necessary farm real estate to carry out their ventures and thereby eliminate the former producer (*4*). New fruit and nut "nonfarm" investors often select farm real estate that has been used for other purposes such as crops, forage, or livestock raising. Also, they often try to select locations that have potential for future use in urban development or highways. Successful selection of such sites not only gives them the income tax advantages from grove or orchard investment, but they may be able to sell the real estate a few years later at much higher prices. The appreciation qualifies for capital gains treatment.

Successful large-scale farm producers who are in a high income tax bracket also seek additional farming investments which provide tax shelters and in the process, often displace smaller family labor size units. High marginal tax rates encourage expansion through the use of borrowed funds, and these large-scale farmers benefit from the high financial leverage and the deduction of the subsequent interest costs. They also take advantage of land clearing or soil conservation expenditures which are currently tax-deductible expense items, though the amount allowed annually is limited (*16*, p. 27-28; *18*, *36*).

Current farm income tax provisions may also provide incentives for vertical integration or for conglomerate structures to enter or form within agriculture to achieve the benefits of differential income tax treatment. Apparently, one attraction for vertical integration in agriculture may be the possibility of accumulating profits at different levels and transferring them to the farm level, where they can be converted in whole or part to capital gains (*27*, p. 13-16).

Dean and Carter argued over a decade ago that the inclusion of Federal income taxes drastically changes the economies-of-scale curves facing individual owner-operators on highly commercialized cash crop farms in the Imperial Valley of California (*8*). They concluded that, as the equity percentage is reduced, the average cost curve after Federal income taxes shifts to a lower position and net returns to management increase, that is, an individual who reaches a given level of output with as little owned capital as possible has a cost advantage. Since large-scale farm units and nonfarm investors have borrowed more money, it may be inferred that the marginal tax rate structure does influence the size of firms in agricultural production and increases pressure for farm firm expansion (*18*).

There has been increasing farm size in the farming area that Dean and Carter studied. It is not clear, however, whether the tax provisions are largely responsible for the increased farm size or are simply one of several factors pushing in that direction. More recently, Carman has updated their results (*4*). Harl, on the other hand, argued that the legal and tax structure used in agriculture does not discriminate systematically against small-scale farmers and for large-scale firms in agricultural production (*15*, *16*). There are a number of income tax variables where the smaller scale farmer qualifies for special treatment and escapes limitations imposed directly or indirectly upon large-scale firms (*19*, *20*). The resolution of these apparently conflicting positions will require further conceptualization and empirical verification.

Federal Income Taxes and Agricultural Policy

Federal income taxes could be used to assist in meeting agricultural and food system policy objectives. However, agricultural policy objectives are seldom formulated to suggest a specific tax policy. For instance, an agricultural policy objective may be to preserve and strengthen the family farm. Such an objective does not indicate whether the Internal Revenue Code might be amended to encourage nonfarm investors to own beef cows that family farmers would care for, or to encourage nonfarm investors to provide machine services for family farmers. Such concerns have generally not been considered in developing agricultural policy since tax legislation is made by different Cabinet-level departments and congressional committees.

However, Congress may be reluctant to approve new tax-induced incentives for agriculture. The general argument against such incentives is that an income tax policy should be investment neutral, and that subsidies should be in the form of direct Federal payments and thereby subject to direct budgetary control of Congress. The important unresolved issue in congressional deliberations on the 1969 Tax Reform Act revolved around the question of providing differential income tax treatment for the agricultural sector (*32*, *39*). Even though methods to assist in achieving agricultural policy objectives outside of direct agricultural programs are not likely to be adopted in the near future, agricultural economists can make substantial contributions to public policy by focusing on the key areas that have been discussed. The Treasury Department does not have the necessary expertise in agricultural economics and is not likely to obtain the expertise to do the necessary research.

Concluding Observations

The term "tax shelter" has been used to describe an investment which produces tax losses which are used to shield income that would otherwise be subject to tax. The tax losses produced by such investments do not necessarily correspond to economic losses. The tax shelter can result in a deferral of tax which approaches exemption as the period of deferral lengthens. In addition, tax shelters may involve conversion of ordinary income into capital gains when the economically excess deductions are later "recaptured" (taxed at preferential long term capital gains rates).

Implications. Because the tax shelter mechanism results in a reduction in the effective rate of tax on income from investment in the tax shelter, presumably investors respond by reallocating their limited investment funds. Economic theory suggests they will do this until their after-tax rate of return on investments in tax shelters is the same as the after-tax rate of return on alternative investments of equal risk which do not receive a tax subsidy (*30*).[9]

If after-tax rates of return tend to be equalized, then the important economic question becomes one of determining how much investment must flow into the tax-favored industry to equalize after-tax rates of return. Tax losses reported on tax returns strongly suggest that tax-induced investments in agriculture run into billions of dollars. Investment flows of these magnitudes can clearly be expected to have some effect on farm prices and incomes and on consumer food prices. Empirical evidence regarding how much of an effect is almost entirely nonexistent.

It has been suggested that farmers were given preferential treatment because they were believed to be incapable of complying with accounting methods required of other businesses. It has also been suggested that accounting principles are not well enough developed to cope with livestock accounting. Leaders in the livestock breeding industry argue that their industry could not exist without the present special income tax concessions, since the rates of returns are very low and the capital requirements very high. Whether these contentions are true today is unknown. Directly identifiable farm program subsidies have existed for several farm commodities. The subsidies are subject to at least a modicum of budgetary restraint. If, in fact, the U.S. beef industry cannot remain viable without a subsidy, administrative considerations suggest that the subsidy should be identified and be made subject to direct public budgetary restraint. The chairman of one cattle management firm, however, makes a strong case for the indirect subsidy (*24*, p. 222).

Unlike the cattle breeding industry, which seeks to continue cash accounting, the egg industry has expressed interest in switching to accrual accounting. The egg industry contends that cash accounting contributes to wide variations in annual egg production and consequently to average higher egg prices to consumers (*39*, p. 26). Once again, empirical verification is lacking. Given the lack of verification, the industry is likely to continue to push for and possibly obtain something that may not produce the desired results for either the industry or the public.

Current income tax provisions affect not only nonfarm investors who invest in agriculture, but also bona fide farmers who receive most of their income from farming. Income tax provisions can have a direct effect on farm firm structure through influencing the decisionmaking process of bona fide farmers and the way they accumulate, allocate, and dispose of their

wealth (*19*). The provisions can also influence the structure and policies of other firms that deal with agricultural production firms.

A start on research. In our search of literature we found an almost bare cupboard of statistical treatments of the effects of the current income tax code and regulations on the cost of agricultural inputs, product prices, income, the structure of agriculture, and consumer prices. Most of the literature consists of descriptions of the code and regulations, ways in which farmers can use tax provisions to their advantage, congressional testimony of special interest groups, and general income tax books and references.

Given the apparent size of the tax subsidy, we suggest that more analytical research resources and primary data collection resources can profitably be used. No data are specifically collected on an ongoing basis for analysis of the issues that we have raised and data collected for other purposes do not generally have direct application. However, simulation studies similar to the Harrison and Woods study could be made in large part from secondary farm expense and income data for tax-incentive investing in cattle feeding, swine breeding and feeding, and nonfarm investing in orchards and nut groves, among others. The conflicting results of Dean and Carter versus Harl also might be resolved with the use of existing secondary data.

To answer the questions posed by the Treasury Department and the congressional tax-writing committees, however, would require large outlays for primary data collection. To analyze the effects of converting all farms to accrual-basis accounting would require interviews with producers of various sizes and types of operations (single versus multiple enterprises and dry lot versus range care of beef cows) who do and do not keep accrual-basis records that would be acceptable for Internal Revenue reporting purposes. A useful place to start such a study may be with farm record projects of the land grant universities, commercial banks, or the retail outlets of the Farm Credit System that keep records and provide analysis for farmers.

Likewise, to determine the dollar amount of tax-induced investment and pertinent characteristics of the owners of beef breeding herds, feeder cattle, orchards and nut groves will require large-scale surveys. If large-scale surveys do not produce the desired degree of detail, it may be necessary to use selected sample surveys of firms that arrange and manage herds and groves for absentee owners as well as direct interviews with absentee owners.

Careful thought needs to be given to the specific kinds of data needed to analyze the effects of income tax variables on farm input costs, farm product prices, structural influences, and consumer prices. The interest and assistance of accomplished economic and econometric model builders should be sought. Given the current state of the arts, it may not be feasible to determine the net influence of tax incentives on farm input prices such as land, fertilizer, and machines. Numerous other variables also affect the cost of these items. However, interviews with both full-time farm operators and with nonfarm investors with tax loss motives should provide good descriptive clues to the importance they give tax loss incentives when they bid on farm inputs.

Similar problems will be encountered in building economic and econometric models for farm income, structural impacts, and consumer prices. Availability and cost of money, the level of consumer incomes, worldwide demand, and many other variables influence farm income and consumer food prices, and with different weights during different time periods.

When technical competence and experience with building and analyzing results of applicable tax models have been developed, it may be possible to include income tax variables in aggregate agricultural supply response models. Tax loss variables could prove to be important in explaining the supply of agricultural production under various conditions, in combination with more traditional variables such as direct farm costs and projected product prices.

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Notes

[1]The terms tax incentive, tax shelter, tax profit, tax loss farming investment, and expensing are used interchangeably in this paper. They refer to incentives to invest in agriculture as a result of the current income tax code and regulations. Tax shelters probably serve to sweeten the incentives but probably are seldom the only variable that nonfarm investors use to select agriculture. Considerable nonfarm capital has apparently entered agriculture, not necessarily in search of Federal income tax shelters. Such money may be the predominant source of funding for the production of some agricultural commodities.

Tax shelters are available in other sectors of the U.S. economy but the arguments for such incentives in other economic sectors compared with tax-induced investments in agricultural production are beyond the scope of this paper. For a discussion of what a Federal income tax system should accomplish and distortions that a tax system can create, see (*6*, *11*, *12*, *14*, *26*).

[2]One of the better current discussions of alternative accounting methods available to farmers is developed by O'Byrne (*23*). It is obvious from his discussion that taxes are the primary consideration in the choice of farm accounting methods rather than the lack of ability to use methods other than the cash method.

[3]The 1969 Tax Reform Act attempted to recapture some farm losses. Taxpayers with nonfarm adjusted gross income (AGI) over $50,000 are required to place the excess of their farm losses over $25,000 into a special excess deduction (EDA) account. Gain on the subsequent sale of farm property is treated as ordinary income to the extent of EDA balances. EDA is reduced by farm income in a subsequent year and EDA balances are also reduced to the extent that they are used to offset capital gains on the sale of farm property. The Act also requires that taxpayers with substantial amounts of otherwise tax-free income pay a minimum tax on at least a portion of the income. For example, after deduction of a $30,000 exemption and after deduction of the taxpayer's regular Federal income tax, the remainder is taxed on a 10-percent rate (*39*, p. 4). Thus, the tax profit shown in the example may not be $75,000, depending on the nature and magnitude of the taxpayer's other income and expenses over a period of several years.

[4]Some of the money may be obtained, however, from traditional agricultural lending sources such as country banks, the Farm Credit Administration, and agricultural departments of life insurance companies, since nonfarm investors often borrow much of the money they invest in agricultural production.

[5]Some types of investments in agriculture, such as cattle feeding, provide an annual or more frequent turnover of the investment. Other types, such as beef breeding herds and orchards, may require outlays for 2 or more years before the product is sold. Since taxpayers' incomes fluctuate and there are numerous agricultural and nonagricultural tax shelter investment opportunities, the same taxpayers do not necessarily reinvest in agriculture. Extensive work is needed to refine the estimate of the magnitude of nonfarm investments in agriculture. Indications from farm management records are that an investment of $4 to $7 is required for $1 of tax loss—an assumption used to arrive at the above figures.

[6]The provision does not apply if an individual or firm is in the business of raising or selling breeding stock.

[7]If $25,000 of the $100,000 of ranch income is considered capital gain the tax computations are as follows:

(1) $100,000 of expenses minus $75,000 of ordinary income equals a net (tax) loss of $25,000. As the $25,000 loss can be deducted against other ordinary income the actual cost to the taxpayer is $7,500 ($25,000 times 30 percent). The remainder (70 percent of $25,000) represents the tax he would have paid on the $25,000 of other income but for the offsetting deduction.

(2) The $25,000 capital gain is subject to the 35-percent capital gains tax rate resulting in an after-capital-gains tax profit of $16,250.

(3) The new result of the two-step tax calculation leaves the taxpayer a net profit after taxes of $8,750 ($16,250 minus $7,500).

Following the calculations above, the $50,000 ordinary loss actually costs the taxpayer $15,000 (30 percent of $50,000). The capital gains tax on $50,000 is $17,500 (35 percent of $50,000, leaving a net profit of $17,500.

[8]The term "structure of agriculture" has come to imply several different concepts. It may refer to number and size of farm production units, assets, debts, net worth of farm production units, and volume of a commodity produced under contract or produced by vertically integrated production and marketing firms. Decisionmaking in agriculture a few years ago implied that decisions were made mostly by farm operators. Now, many hired management firms make on-the-form production decisions for their employers, and where there is low equity in a farm business, production decisions are often made jointly by the farm resource owner, the operator, and a financial institution.

[9]When after-tax rates of return are equalized, the before-tax rate of return for the tax shelter investment is less than that for nonsheltered investments. When other things are equal, this implies a misallocation of resources (*28*, *29*, *30*).

BOOK REVIEWS

Water Resource Management in Northern Mexico

By Ronald Cummings. Resources for the Future, Inc., 1755 Massachusetts Avenue, N.W., Washington, D.C., 20036. 68 pages. 1972. $3.50.

Many of the less developed countries have become acutely aware of the need to provide greater economic opportunity and higher living standards for their rural populace. Lip-service attention to the agricultural sector is no longer sufficient if population migration to overcrowded urban centers is to be arrested, national nutrition levels raised, and foreign exchange positions strengthened.

Several Latin American countries, including Argentina, Chile, Ecuador, Peru, and Mexico, are becoming increasingly dependent on irrigation to expand agricultural production. Partly because of climatic and topographic conditions, huge sums of money have been committed to transfer water supplies to existing and planned agricultural zones. Given the narrowing limits on financial resources available for development purposes, it is highly desirable that project planners utilize the water resource as efficiently as possible.

Ronald Cummings develops a methodology that should permit water managers in all countries to put an important question into the perspective necessary for dealing with it: How should a reservoir be managed and irrigation water be allocated so as to maximize the net social value of agricultural production? Cummings selected the Comarca Lagunera irrigation district in northeastern Mexico as a case study. Conditions in this area are similar to those in irrigation districts throughout Mexico: (a) the district is arid and receives its water supply from a distant (200 kilometers) mountain reservoir; (b) water receipts to the reservoir are erratic and evaporation rates are high (11.6 percent of annual water storage); (c) transmission losses are also high (50 to 70 percent of the water diverted from the reservoir) because of noncompacted dirt canals and laterals, and wide dispersion of the plots being irrigated; (d) water is allocated at the farm level in overly generous quotas based on a "maximum plant growth" concept of efficiency, even though actual farm technology is quite backward.

Although the social criteria for water management are nebulous and nonquantifiable, Mexican government policies indicate major concern for providing farmers with maximum income levels as well as income stability from year to year. Reservoir management plays a crucial role in attaining these objectives. The optimal policy would in some way balance the forces that dictate small reservoir stocks and large annual releases (that is, social discount rates reflecting high time-preference rates for consumption and high water losses from evaporation) with those that call for large stocks and small releases (diminishing marginal productivity of water and the desire for income stability).

To show the trade-offs between income maximization, year-to-year income stability, and other criteria associated with alternative management decisions, Cummings formulates an optimization model based on maximizing the present value of expected net incomes. The relevant cost-concerning alternative decision is defined as foregone income.

Solutions from the model were found to be particularly sensitive to the social discount rate, the evaporation rate of the reservoir stock, and the number of years in the planning horizon. The study indicated that high returns could be obtained by consolidating dispersed irrigation plots, thereby reducing transmission losses. It also appears that a reconsideration of water quotas, based on the existing low level of farm technology rather than on the high levels developed from experimental data, may result in lowering quotas of water per hectare. The net result would be an effective increase in water supply for distribution to new lands.

While the results of this study are not startling, the methodology used has general applicability for dealing with agricultural water resource development. The report is clearly written, and shows a thorough understanding not only of economic concepts but also of the institutional, political, and social factors that define the decision environment of resource managers.

John D. Sutton

The Development of Tropical Lands: Policy Issues in Latin America

By Michael Nelson. Published for Resources for the Future by The Johns Hopkins University Press. Baltimore, Md., 21218. 306 pages. 1973. $12.50.

Resources for the Future's latest contribution to the comprehensive treatment of world resources focuses almost entirely on the humid tropics of Latin America, although the author draws on certain experiences outside the area. For a concise, economic presentation of problems encountered in settling humid tropics, however, one probably cannot do better than to start with this book. Seventy of its 300 pages are devoted to analysis of 24 selected development projects. Each of the eight chapters is well developed and can be taken out of context without limiting its effectiveness. (The presentation is buttressed by 33 tables, 11 maps, and six figures.) The author and Resources for the Future are to be commended for an excellent treatment of the subject.

Chapter headings are: The Role of Tropical Lands in Development in Latin America; Two Theories of Land Development in the Humid Tropics; The Development of New Lands; Current Practice and Problems; Project Evaluation; A Survey of Twenty-four Development Projects; The Conservation and Use of Natural Resources; Factors Affecting Development Policy: 1. Area Selection, Beneficiaries, and Infrastructure; 2. Economic, Technical, and Administrative; and Policy Implications and Project Design.

Visions of return to the Garden of Eden tend to color the public expectations of the development of tropic forests. Michael Nelson's well documented evidence indicates that the curse imposed on Adam, "by the sweat of thy brow shalt thou eat thy bread," continues to be true in the tropic forests of Latin America. Unfortunately, profitable exploitation of the tropic wilderness seems also to depend on continued exploitation of people who are accustomed to a subsistence level of living.

Nelson's "Two Theories of Land Development" boil down to reasons for and reasons against the concerted development of the humid tropics. The antidevelopment or conservationist approach looks at the enormous cost and lack of adequate knowledge or technology. The prodevelopment approach looks at the unused resources, the real human need, and the technological challenge of development.

So far, less than 15 percent of the Latin American humid tropics has been used for crops or pasture. About 2 percent is currently in crops; a somewhat larger area has been used for crops and then abandoned or left in long rotation; and large areas of former cropland are now in permanent though largely unimproved pasture. About 10 percent of the total area is currently pastured.

What would be the impact on agricultural and forestry production and on world trade of the development of another continent the size of North America? This, in effect, is one question posed when considering the development of Latin America's humid tropics. The area's delineation is imprecise, since Nelson does not include the highland or desert areas, but somewhat arbitrarily includes the semiarid Chaco area of Bolivia and Paraguay; he omits the Yucatan Peninsula of Mexico, the Pacific Coast of Central America, and all of the Caribbean Islands. Nelson suggests that nearly 3 billion acres are available for development. This is an area somewhat larger than the United States and Canada below the northern limits of cultivation, and is about double the U.S. and Canadian area presently used for crops, pasture, and range.

About 68 percent of the area is currently in some type of forest and 26 percent is tropical savanna; the rest is semiarid land. Cultivation of Nelson's humid tropics is less affected by rugged topography or limited rainfall than is much of the United States and Canada. However, the area is more subject to flooding, poor drainage, and excess rainfall, which may be just as limiting to development for the foreseeable future.

Through Nelson's presentation run the themes of lack of technology, market problems, and land tenure and other institutional factors. He refers to both successes and failures in plantation agriculture but deals largely with attempts to settle small peasant farmers. He points out the sometimes contradictory nature of land settlement and agricultural production goals.

The allocation of large amounts of funds to subsidize and facilitate resource-wasteful exploitation poses a clear policy issue, for which he makes no clear recommendation. Apparently, governments and international agencies will continue their efforts to perfect the details of development, without clearly facing the issue of whether or not they should carry out the development. One thing is clear—it is essential to maintain a viable society while the search for development alternatives continues.

Howard A. Osborn

World Bank Operations: Sectoral Programs and Policies

Published for the International Bank for Reconstruction and Development by The Johns Hopkins University Press, Baltimore, Md., 21218. 513 pages. 1972. $12.50.

The Bank for Reconstruction and Development (commonly known as the World Bank) has been lauded as a leading force in the fight against world poverty. No doubt it has resources to carry out this program. It has a total financial commitment of $23 billion in 100 countries and lending operations now running at an annual rate of $3 billion. However, the Bank has received strong criticism from both extremes of political and economic persuasion. It has been branded by the left as neocolonialist and paternally arrogant, and on the right as being without accountability.

The book is a series of papers written by Bank officials over a 12-month period, detailing a sector-by-sector analysis of problems and policies faced by the Bank in various fields. The 10 papers cover four broad areas in which the Bank operates: infrastructure, agriculture, industry, and general development. Each paper describes the economic, financial, and institutional characteristics of the sector and outlines the role played by each sector in the process of economic development.

For several decades following World War II the Bank was not the main force in international development. The recovery program of the United States, notably the Marshall Plan, was the major factor in economic aid. In the late 1960's, under the direction of Robert McNamara, the Bank made substantial expansion and diversification of its commitments, giving increasing attention to such matters as income distribution, environmental consideration, urbanization problems and research.

It was a wise procedure and resulted in many successful projects. What may have been overlooked, however, was that successful projects do not necessarily result in overall economic and social growth. Experience has shown that it is quite possible for a country to have many individual successful projects, but these may sustain little or no growth in the economy as a whole, because the mass of the people frequently are not participating in the fruits of the increased output. And there lies the key to the problem. If population continues to grow at the present rate there will be 15 billion people on the globe in 2125 compared with almost 4 billion today. If social and economic development is to be achieved, population growth must be reduced.

This book could be invaluable to all who are interested in economic development, since it is the first detailed picture of the World Bank at work.

Jack Ben-Rubin

The Life of Arthur Young, 1741-1820

By John G. Gazley. American Philosophical Society, Independence Square, Philadelphia, Pa., 19106. 727 pages. 1973. $10.

This is a strictly chronological biography of a leading exponent of the English agricultural revolution, whose writings were in the libraries of many of the American leaders in the late colonial and early national period. Young influenced the economic situation of the English farmer through voluminous writing and lectures. As Secretary of the British Board of Agriculture he made a number of County surveys and discussed legislation. Still serving in this capacity, at the age of 76 he prepared and sent out circulars to determine agricultural conditions, requesting information on rental and abandonment of farms, farm labor, and suggested remedies. However, much of the book relates to his interest in the political and religious life of the period, as well as family affairs.

The Council of Economic Advisers: Three Periods of Influence

By Hugh S. Norton. Bureau of Business and Economic Research, University of South Carolina, Columbia, S.C., 29208. 72 pages. 1973. $2.50 (paper).

The author discusses the Council during the administrations of Presidents Truman, Eisenhower, and Kennedy, as the periods of its peak influence.

Heritage of Plenty

By Harold D. Guither. The Interstate Printers & Publishers, Inc. 19-27 North Jackson Street, Danville, Ill., 61832. 295 pages. 1972. $4.95.

The author, who is Associate Professor of Agricultural Economics at the University of Illinois, presents strong statistical backing for this history of American agriculture. The volume is also unusual in that the author looks ahead to future agricultural development. The book is well arranged and, although the discussions are brief, substantial additional readings are listed for each chapter.

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